Docket No.: 0505-1271P
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Shinichi OZEKI

Application No.: 10/776,525 | Confirmation No.: 4135

Filed: February 12, 2004 | Art Unit: 3616

For: STRUCTURE FOR INSTALLING REAR CUSHION | Examiner: T.C. To

VERIFICATION OF TRANSLATION

The undersigned hereby declares the following:

That I am knowledgeable in Japanese and English. That I have reviewed the Japanese Patent Application No. 2003-043076 and Japanese Patent Application No. 2003-049798 and verify that the attached document is an accurate translation thereof.

All statements made herein of my own knowledge are true and all statements made on information and belief are believed to be true. Further, these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

July 20, 2007
Date

Signature

[Title of the Document] Specification

[Title of the Invention]

STRUCTURE OF INSTALLING REAR CUSHION

[Claims for the Patent]

[Claim 1]

Structure of installing a rear cushion,

a rear suspension being equipped with: a rear swing arm, a front end of which is supported in such a manner as to be freely rock-able on a vehicle body side through a pivot shaft, and a rear wheel of which is supported at a rear end; a cushion bracket provided on a upper portion of said rear swing arm on a front end side; a link for coupling a lower portion of said rear swing arm on the front end side to the vehicle body side; and a rear cushion, upper and lower portions of which are supported by said link and said cushion bracket, characterized in that

when observed from its side, said cushion bracket extends in a back-and-forth direction beyond the upper portion of said rear cushion, both end portions thereof before and behind are coupled to said rear swing arm, and the upper portion of said rear cushion is supported by an intermediate portion in the back-and-forth direction.

[Claim 2]

The structure of installing a rear cushion according to Claim 1, characterized in that said rear swing arm has a pair of left and right arm portions, a pair of left and right cushion brackets are also provided, the respective front and rear end portions are coupled to first and second cross members provided at an interval in the back-and-forth direction between upper

portions of said left and right arm portions on the front end side.

[Claim 3]

The structure of installing a rear cushion according to Claim 2, characterized in that the upper portion of said rear cushion is supported between said left and right cushion brackets, and has a subsidiary cylinder which has been arranged through space enclosed with said left and right cushion brackets and said first and second cross members before and behind.

[Detailed Description of the Invention]

[0001]

[Field of the Invention]

The present invention relates to structure of installing a rear cushion in a motorcycle.

[0002]

[Prior Art]

In a certain rear suspension mechanism of a motorcycle or the like, a front end of a vehicle body-side rear swing arm is supported in such a manner as to be freely rock-able by a pivot shaft, the rear swing arm is provided with a cushion bracket in the upper portion on the front end side thereof, the lower end of the rear swing arm on the front end side is coupled to the vehicle body side through a link, and the upper and lower portions of the rear cushion are supported between this link and the cushion bracket (See, for example, Patent Literature 1).

[0003]

[Patent Literature 1]

[0004]

[Problems to be Solved by the Invention]

A pair of left and right rear swing arms are provided with the above-described cushion brackets so as to make a pair with each other, protruding upward in a substantially mountain shape respectively. Also, each cushion bracket supports the rear cushion at an upper end which becomes a free end, and is supported on the rear swing arm only at the lower end. Therefore, when the cushion bracket is viewed in terms of one side of left and right, each is constructed to, so to speak, cantilever-support the rear cushion. For this reason, in order to secure as great installation rigidity as possible for supporting a heavy load of the rear cushion, the cushion bracket cannot avoid becoming large size, but as a result, the weight has been increased to increase the cost. Therefore, it is an object of the present application invention to provide a small-sized, light-weight and low-priced cushion bracket having high rigidity.

[0005]

[Means for Solving the Problems]

In order to solve the above-described problem, according to the invention of Claim 1 concerning structure of installing a rear cushion of the present application, there is provided a rear suspension equipped with: a rear swing arm, the front end of which is supported in such a manner as to be freely rock-able on the vehicle body side through a pivot shaft, and the rear wheel of which is supported at the rear end; a cushion bracket

provided on the upper portion of this rear swing arm on the front end side; a link for coupling the lower portion of the rear swing arm on the front end side to the vehicle body side; and a rear cushion the upper and lower portions of which are supported by this link and the cushion bracket, characterized in that when observed from its side, the cushion bracket extends in a back-and-forth direction beyond the upper portion of the rear cushion, both end portions thereof before and behind are coupled to the rear swing arm, and the upper portion of the rear cushion is supported by the intermediate portion in the back-and-forth direction.

[0006]

According to Claim 2, there is provided the structure of installing a rear cushion described in the above-described Claim 1, characterized in that the rear swing arm has a pair of left and right arm portions, a pair of left and right cushion brackets are also provided, the respective front and rear end portions are coupled to first and second cross members provided at an interval in the back and forth direction between upper portion of the left and right arm portions on the front end side.

[0007]

According to Claim 3, there is provided the structure of installing a rear cushion described in the above-described Claim 2, characterized in that the upper portion of the rear cushion is supported between the left and right cushion brackets, and has a subsidiary cylinder which has been arranged through space enclosed with the left and right cushion brackets and

the first and second cross members before and behind.

[0008]

[Advantages of the Invention]

According to Claim 1, since the cushion bracket has been extended long in a back-and-forth direction beyond the upper portion of the rear cushion and the both ends thereof have been coupled to the rear swing arm, when the intermediate portion of the cushion bracket is caused to support the upper portion of the rear cushion, the cushion bracket will be constructed to support the rear cushion at both ends when observed from its side. For this reason, the installation rigidity of the cushion bracket becomes higher, and yet it is possible to miniaturize, to reduce the weight and to reduce the cost.

[0009]

According to Claim 2, the rear swing arm has been provided with a pair of left and right arm portions, a pair of left and right cushion brackets have been provided, front and rear end portions of the left and right cushion brackets have been coupled to a pair of cross members provided at intervals before and behind between the upper portions of the left and right arm portions on the front end side. Therefore, when the upper portion of the rear cushion is coupled to between the intermediate portions of the left and right cushion bracket, this coupled portion can be provided with the highest rigidity.

[0010]

According to Claim 3, since there is formed space enclosed with the left and right cushion brackets and the first and second cross members before and behind, this space can be utilized

to dispose a subsidiary cylinder of the rear cushion. Moreover, there is no need for the provision of special space for disposing the subsidiary cylinder, but the space efficiency can be improved.

[0011]

[Embodiments of the Invention]

Hereinafter, with reference to the figures, the description will be made of embodiments. Figs. 1 to 4 show an example in which the present invention has been applied to a supporting-at-both ends type rear swing arm, and Fig. 1 is a side view showing a motorcycle according to the present embodiment; Fig. 2 is a side view showing a rear suspension portion; Fig. 3 is its plan view; and Fig. 4 is a cross-sectional view showing a link mechanism.

[0012]

In Fig. 1, a reference numeral 1 designates a front wheel; 2, a front fork; 3, a head pipe; 4, a handlebar; and 5, a main frame. The main frame 5 is shaped like a longitudinal square cylinder, made of light alloy, and branches off into left and right parts from the head pipe to extend obliquely downward toward the rear.

[0013]

Below the main frame 5, there is supported a series four-cylinder engine 6. There are two supporting points: a coupling point 7 between the intermediate portion of the main frame 5 and the upper portion of the cylinder; and a coupling point 9 between the rear end of the main frame 5 and the upper portion of the a mission case 8 for constituting the engine

6 at rear end.

[0014]

Air is sucked at downdraft into an intake port 10 of the engine 6 from an air cleaner 11 supported by the main frame 5. A reference numeral 12 designates an injector. The air cleaner 11 is accommodated within a recess formed on the side of a base of the front portion of a fuel tank 13.

[0015]

An exhaust pipe 16 extends forward from an exhaust port 15, runs below the engine 6 to extend toward the rear, and is connected to a pair of left and right mufflers 17. The left and right mufflers 17 are disposed on both sides of the rear wheel 18. A reference numeral 19 designates a radiator arranged in front of the engine 6.

[0016]

A pair of left and right seat rails 20 are provided obliquely upward toward the rear from the rear end portion of the main frame 5, and with the periphery thereof enclosed, there is provided a rear cowl 21, on top of which there is provided a seat 22.

[0017]

In the intermediate portion in the up-and-down direction of the mission case 8 at the rear end, the front end portion of the rear swing arm 24 is supported by the pivot shaft 23 in such a manner as to be freely rock-able in the up-and-down direction. At the rear end of the rear swing arm 24, there is supported the rear wheel 18.

[0018]

A reference numeral 25 designates a rear cushion; 26, a step bracket; 27, an output sprocket; 28, a chain; and 29, a driven sprocket. Further, a portion from the front surface of the vehicle body to both left and right side surfaces is covered with a front cowl 30.

[0019]

A case composed of a crankcase 31 of the engine 6, the mission case 8 and the like is divided into upper and lower parts, and the pivot shaft 23 is somewhat downward deviated from this slit surface 32.

[0020]

As shown in Fig. 2 and Fig. 3, the rear swing arm 24 is of a supporting-at-both ends type, having a pair of left and right arm portions 33 for supporting the rear wheel 18 on its both sides, and the upper portions of the front end portion thereof are coupled together through a first cross member 34 and a second cross member 35. The first cross member 34 and the second cross member 35 are provided with an interval in the back-and-forth direction, the first cross member 34 is shaped like a pipe, a supporting portion at both ends thereof is a protruded portion 36 for protruding upward, provided on the upper surface of the left and right rear swing arms 24 at the front ends.

[0021]

A tip end portion 33a of an arm portion 33 in which the protruded portion 36 is formed is a portion for bearing-supporting the pivot shaft 23, and is formed together with the protruded portion 36 by casting or the like through

the use of an appropriate material such as light alloy.

[0022]

The second cross member 35 is a cross member made integral with the left and right arm portions 33 with each other respectively by welding or the like. Between these first cross member 34 and second cross member 35, there are provided a pair of left and right cushion brackets 37 which extend in parallel in the back-and-forth direction with an interval from side to side. The cushion bracket 37 extends in the back-and-forth direction beyond the upper end portion 38 of the rear cushion 25, and the front and rear end portions thereof are welded to the upper surfaces of the first cross member 34 and the second cross member 35 respectively.

[0023]

As is apparent from Fig. 3, there is formed substantially rectangular space 39 when observed from its plan, enclosed with the first cross member 34, the second cross member 35 and the left and right cushion brackets 37, there is located an upper portion 38 in the space, and further, a subsidiary cylinder 40 passes through this space 39 to rise obliquely upward from the upper portion 38 for extending toward the rear.

[0024]

A shoulder bolt 41 which traverses each intermediate portion of the left and right cushion brackets 37 penetrates from one (left side in the figure) to the other (right side in the figure), and is fastened to a nut 42 provided on the other side, whereby the upper portion 38 is supported. At this time, the left and right portions of the upper portion 38 are

supported by a boss 37a for protruding inwards, which has been formed at the central portion of the cushion bracket 37. For this reason, the support rigidity becomes further higher.

[0025]

The pivot shaft 23 is located in the neighborhood of the first cross member 34 when observed from its plan, and at both left and right ends thereof, there are provided a pair of external auxiliary plates 43. At the rear ends of the left and right external auxiliary plates 43, there are installed a step bracket 26 (See Fig. 2) respectively.

[0026]

In the external auxiliary plate 43, there is provided a long boss 44 in the back-and-forth direction, a split surface 45 is formed in the intermediate portion thereof, whereby a bolt 46 is fastened from behind the boss 44 to thereby fasten and fix the pivot shaft 23. A reference numeral 47 in Fig. 3 designates a bolt for fastening the upper and lower split portions of the mission case 8 from above.

[0027]

As shown in Fig. 2, a rear cushion 25 has a damper 50 and a cushion spring 51, and the upper and lower portions of the cushion spring 51 are supported by retainers 52, 53 provided on the upper and lower outer periphery of the damper 50 respectively.

[0028]

A joint metal 54 of the damper 50 for operating a piston which cannot be seen in the figures extends below the damper 50, and the lower end thereof is coupled to one apex portion

56 of a first link 55 which forms a substantially triangle shape. An apex on the other end side 57 is axially installed to a stay 58 which extends from the lower portion of the mission case 8 at the rear end.

[0029]

To an in-between apex portion 59 of the first link 55, there is coupled one end of a linear link arm 60, and the other end is coupled to a link pivot 61. The link pivot 61 is provided at a convex portion 62 for protruding downward from the lower end of the second cross member 35.

[0030]

As shown in Fig. 4, the lower ends 54a of the joint metal 54 are shaped like a fork and sandwich the apex portion 56 therebetween, and a bolt 63 is caused to pass through an opening provided at the apex portion 56 and the joint metal 54 to be fixed by a nut 64 for thereby coupling. The bolt 63 is caused to pass through a collar 65 and a bearing 66 is used between the collar 65 and one apex portion 56.

[0031]

Each of other portions has also the similar structure, and an apex 57 on the other end side is placed within a recess 67 formed at the central portion of a stay 58 in the widthwise direction thereof, and is coupled by a shoulder bolt 70 and a nut 71 through bearings 68, 69.

An apex portion 59 is coupled by a bolt 74 and a nut 75 through a collar 72 and a bearing 73.

A link pivot 61 is a bolt, and is coupled by a nut 78 through a collar 76 and a bearing 77.

[0032]

Next, the description will be made of an operation of the present example. In Fig. 2 and Fig. 3, when a load is inputted to the rear wheel 18 from a road surface and the rear wheel 18 rocks in the anticlockwise direction (upward) in the figures, a link arm 60 rotates a first link 55 in the anticlockwise direction likewise. Therefore, while compressing this against a cushion spring 51, the link arm 60 presses the joint metal 54 upward to generate a damping force within the damper 50.

[0033]

When the load input to the rear wheel 18 disappears, restoration of the cushion spring 51 rotates the fist link 55 and the rear swing arm 24 in the reverse direction to return to their original states.

[0034]

Since the cushion bracket 37 has been extended long in a back-and-forth direction beyond the upper portion 38 of the rear cushion 25 and the both ends thereof have been coupled to the upper portion of the arm portion 33 on the front end side in the rear swing arm 24 as described above, when the intermediate portion of the cushion bracket 37 is caused to support the upper portion 38 of the rear cushion, the cushion bracket 37 will be constructed to support the rear cushion at both ends. For this reason, the installation rigidity of the cushion bracket 37 becomes higher, and yet it is possible to miniaturize, to reduce the weight and to reduce the cost.

[0035]

Also, the rear swing arm 24 has been provided with a pair

of left and right arm portions 33, a pair of left and right cushion brackets 37 have been provided, front and rear end portions of the left and right cushion brackets 37 have been coupled to a pair of cross members consisting of the first and second cross members 34, 35, provided at an interval before and behind between the upper portions of the left and right arm portions 33 on the front end side. Therefore, when the upper portion 38 of the rear cushion is coupled to between the intermediate portions of the left and right cushion brackets 37, it will be supported by the cushion bracket 37 of the supporting at-both ends structure from both left and right sides, and the supporting portion can be provided with the highest rigidity.

[0036]

Further, since there is formed space 39 enclosed with the left and right cushion brackets 37 and the first and second cross members 34, 35 in the back-and-forth direction, this space 39 can be utilized to dispose a subsidiary cylinder 40 of the rear cushion 25. Moreover, there is no need for the provision of special space for disposing the subsidiary cylinder 40, but the space efficiency can be improved.

[0037]

Moreover, since a convex portion 62 of the link pivot 61 has been integrally provided on the lower surface of the second cross member 35, the supporting rigidity of the link pivot 61 in the convex portion 62 becomes higher, and it is possible to easily secure the rigidity of the convex portion 62.

[0038]

Fig. 5 shows another example in which a different type of rear swing arm is used. In this example, a rear swing arm 80 is of the cantilever type, has left and right arm portions 81 and 82, the base side of one arm portion 81 is bent on the other side to make a curvature 83 which crosses ahead a rear wheel 18, and this curvature 83 is caused to continue to a body portion 84 for extending toward the rear from the other arm portion 82, whereby the structure is arranged such that the rear wheel 18 is cantilever-supported by the body portion 84 from one side. Also, ahead of the curvature 83, there is formed space 85 between the left and right arm portions 81 and 82, and within this space 85, a rear cushion 25 is arranged in the up-and-down direction.

[0039]

The structure of other than the rear swing arm 80 is the same as in Fig. 3, and hereinafter, common portions are designated by the common reference numerals, and repeated description will be omitted with the exception of a portion. The upper end supporting structure of the rear cushion 25 in the present example is the same as the previous example, and between a first cross member 34 which has been laid over between the left and right arm portions 81, 82, and the curvature 83, there are provided a pair of left and right cushion brackets 37. By doing so, the upper end of the rear cushion 25 is supported by a cushion bracket 37 provided at the front end portion of the cantilever type rear swing arm 80 which is liable to acquire the rigidity, and therefore, the supporting portion comes to have high rigidity.

Therefore, if the same support rigidity is given, it is possible to further miniaturize and reduce the weight and to reduce the cost.

[0040]

In this respect, the present application invention is not limited to the above-described examples, but it is possible to change and apply in various ways, and for example, the cushion bracket can be integrally formed by forging.

[Brief Description of the Drawings]

Fig. 1 is a side view showing a motorcycle according to the present example;

Fig. 2 is a side view showing a rear suspension portion;

Fig. 3 is a plan view showing the rear suspension portion;

Fig. 4 is a cross-sectional view showing each of coupling points connected in a link mechanism; and

Fig. 5 is a plan view showing the rear suspension portion according to another example.

[Description of Symbols]

1: Front wheel, 3: Head pipe, 5: Main frame, 6: Engine, 18: Rear wheel, 23: Pivot shaft, 24: Rear swing arm, 25: Rear cushion, 33: Arm portion, 34: First cross member, 35: Second cross member, 37: Cushion bracket, 80: Cantilever type rear swing arm

[Title of the Document] Abstract

[Abstract]

[Object]

When the upper portion of the rear cushion is supported by the cushion bracket provided on top of the rear swing arm in the cantilever form, and the other end is coupled to a link for coupling the rear swing arm to the vehicle body side, the cushion bracket will have to be made larger in size and be increased in weight because the cushion bracket supports a heavy load of the rear cushion. This problem will be solved without increasing the weight.

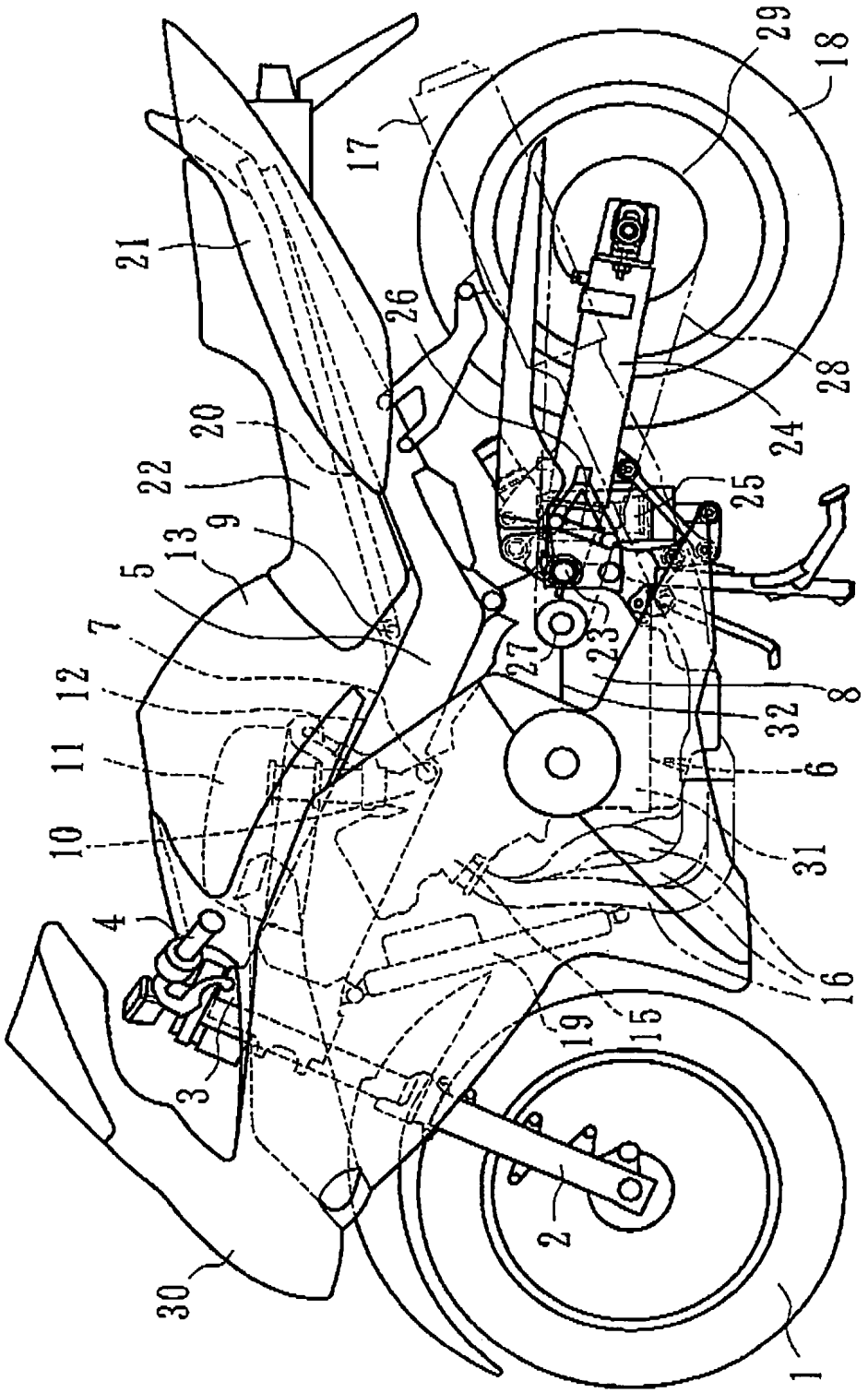
[Constitution]

The rear swing arm 24 is provided with a pair of left and right arm portions 33, their respective front portions are coupled with the first cross member 34 and the second cross member 35. There are provided a pair of cushion brackets 37 extending in the back-and-forth direction with the upper portion 38 of the rear cushion 25 sandwiched therebetween, and their respective front and rear ends are coupled to the first cross member 34 and the second cross member 35 to thereby make the cushion bracket 37 of the supporting-at-both ends structure. Within space 39 enclosed with the first cross member 34, the second cross member 35, and the left and right cushion brackets 37, the upper portion 38 of the rear cushion is placed, and is coupled to the intermediate portion of the left and right cushion bracket 37 through a shoulder bolt 41 and a nut42.

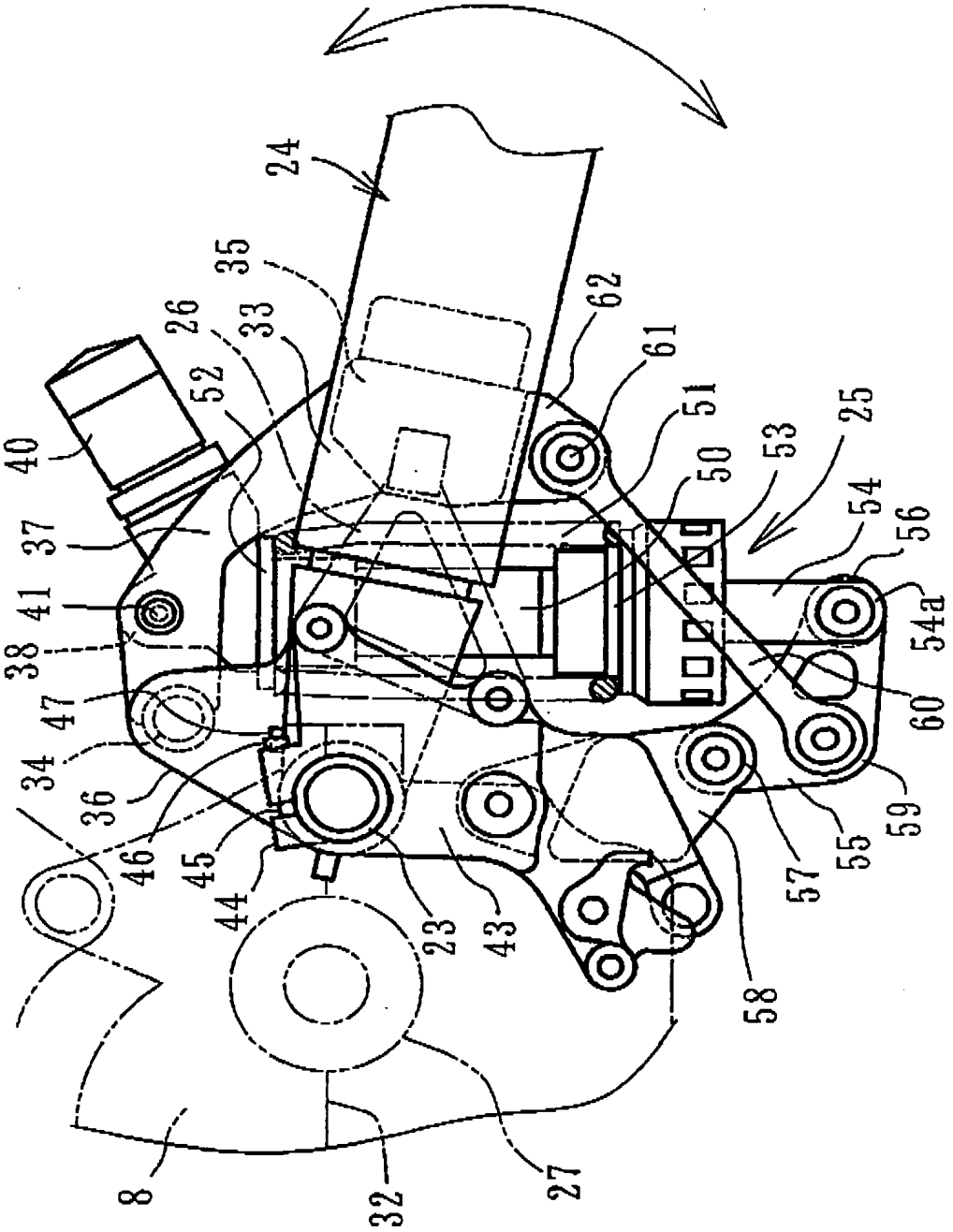
[Selected Drawing] Fig. 3

【書類名】 図面

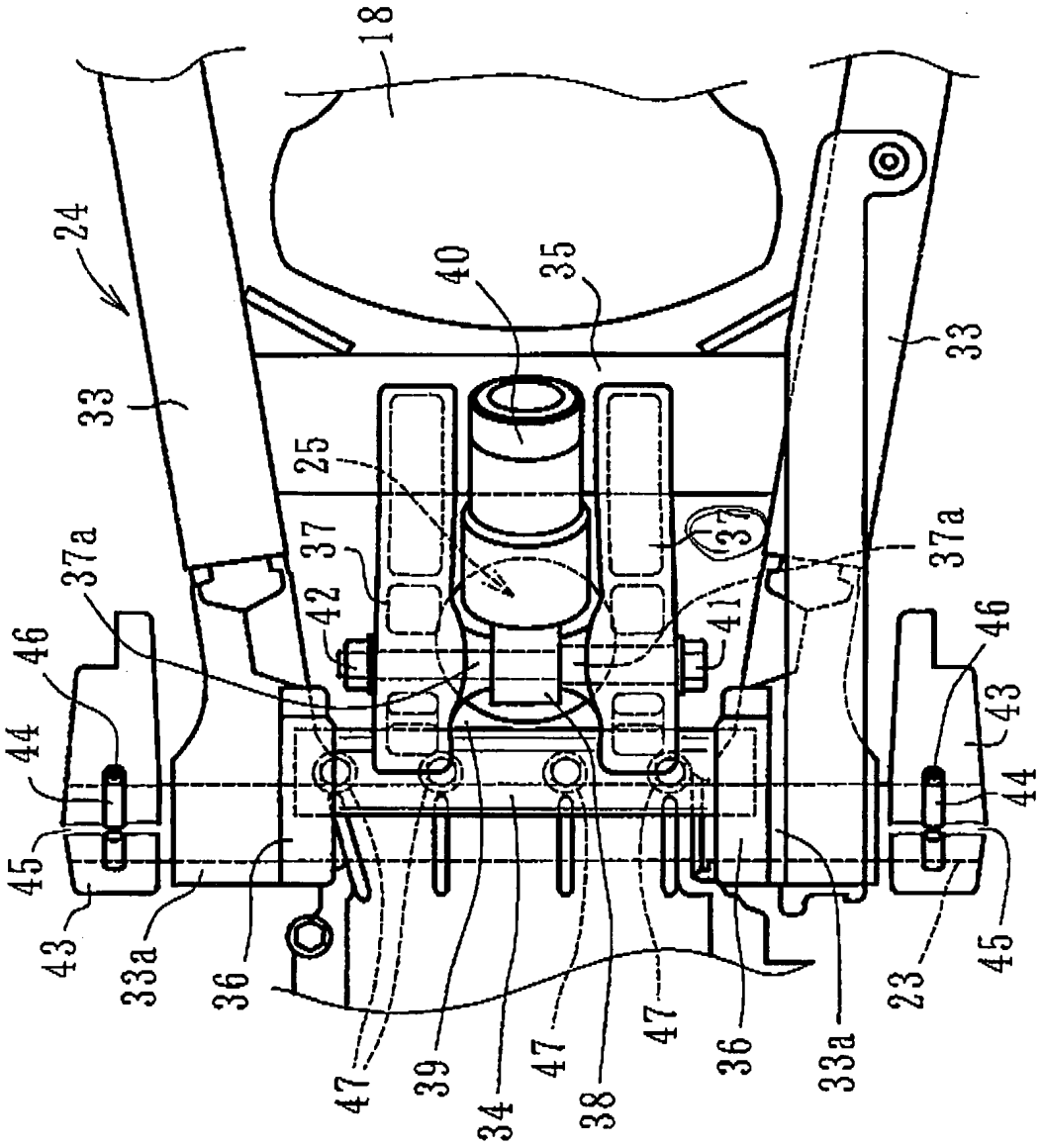
【図１】
Fig. 1



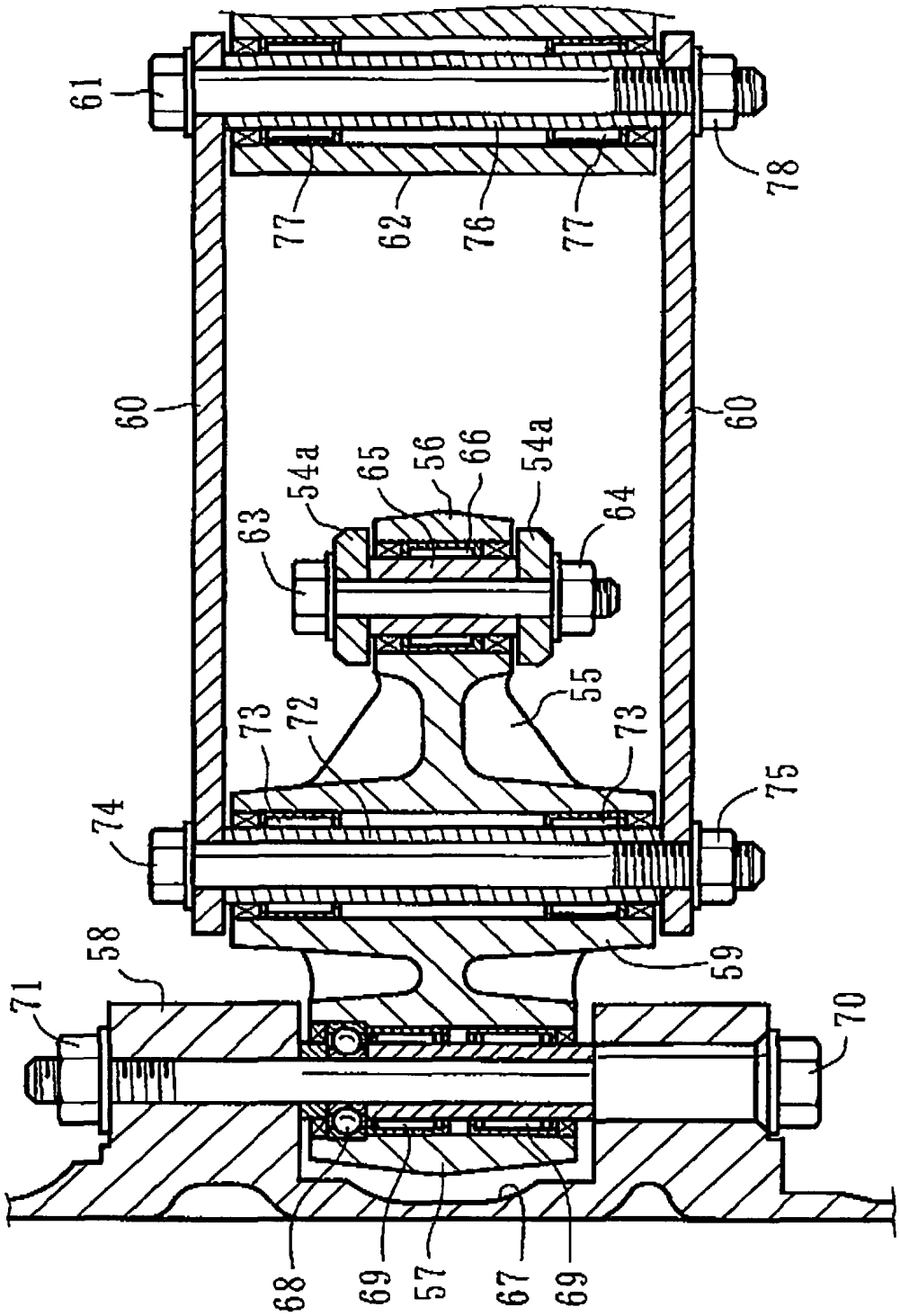
【図２】
Fig. 2


24
35
26
33
62
61
52
51
25
40
50
53
54
56
37
41
54a
38
60
47
34
59
36
46
45
55
44
57
23
43
58
8
32
27

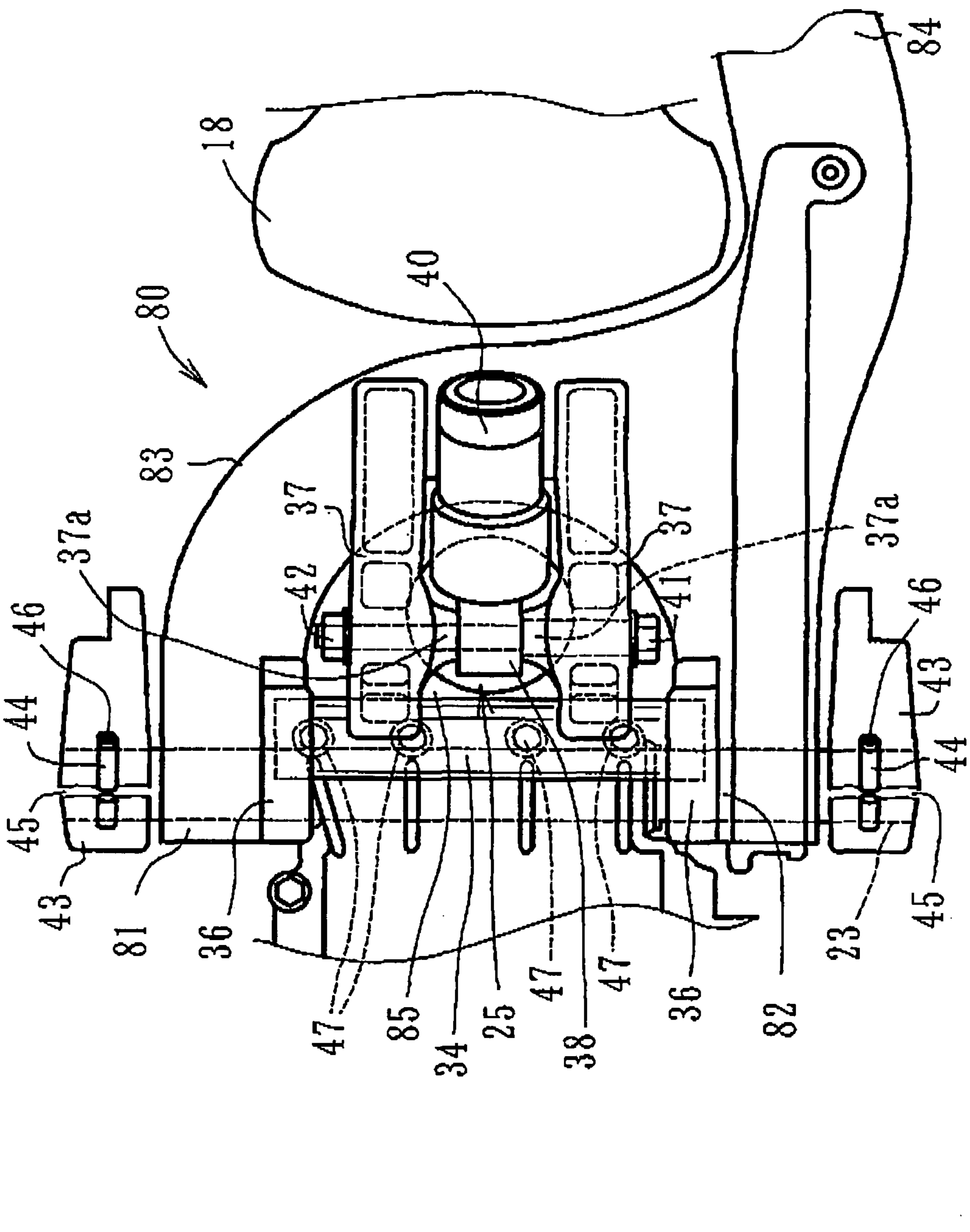
【図３】
Fig. 3


18
24
40
35
33
33
25
37
37
37a
37a
42
41
46
46
44
44
43
43
45
45
33a
33a
36
36
47
47
47
39
34
38
23

【図４】
Fig. 4


61
78
77
62
76
77
60
60
54a
65
56
66
54a
64
63
55
73
72
73
75
74
58
59
71
70
68
69
57
67
69

【図５】
Fig. 5


84
18
40
80
83
37
37a
37
37a
42
41
46
46
44
43
44
43
45
43
81
36
47
85
34
25
47
38
47
36
82
23
45